

**In the Claims.**

The following list of Claims replaces all prior versions.

What is claimed is:

- 1) (original) A method of determining the pH of a sample, comprising:
  - a) Determining an infrared spectrum of the sample;
  - b) Determining the concentration of hemoglobin of the sample;
  - c) Selecting a model relating an infrared spectrum to pH that is applicable for samples having the determined hemoglobin concentration;
  - d) Determining the pH of the sample from the infrared spectrum and the selected model.
- 2) (original) A method as in Claim 1, wherein the model comprises regression coefficients relating an infrared spectrum to sample pH.
- 3) (original) A method as in Claim 1, wherein the model comprises a model determined from calibration data collected from samples with hemoglobin levels spanning the range of sample hemoglobin levels.
- 4) (original) A method as in Claim 1, wherein the model comprises a model determined from hemoglobin-specific regression coefficients applied to calibration data collected from samples with hemoglobin levels that do not span the sample hemoglobin range.
- 5) (original) A method as in Claim 1, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in at least one of transmission, diffuse reflectance, transreflectance, ATR.
- 6) (cancelled)
- 7) (currently amended) A method as in Claim 1, A method of determining the pH of a sample, comprising:
  - a) Determining an infrared spectrum of the sample;
  - b) Determining the concentration of hemoglobin of the sample;
  - c) Selecting a model relating an infrared spectrum to pH that is applicable for samples having the determined hemoglobin concentration;
  - d) Determining the pH of the sample from the infrared spectrum and the selected model;  
wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 4000 – 25000-11000 cm-1.
- 8) (currently amended) A method as in Claim 4~~7~~, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 4000 – 8000 cm-1.
- 9) (currently amended) A method as in Claim 4~~8~~, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 6000 – 6500 cm-1.
- 10) (original) A method as in Claim 1, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation at a spectral resolution of 64 cm-1 or finer.
- 11) (currently amended) A method as in Claim 1, wherein determining the concentration of hemoglobin comprises at least one of:
  - a) Direct measurement of a blood sample using an external instrument or method;
  - b) Spectroscopic measurement of a blood sample; and
  - c) Noninvasive measurement of perfused tissue.
- 12) (original) A method as in Claim 1, wherein determining the concentration of hemoglobin comprises at least one of:
  - a) Measuring the sample hemoglobin concentration under physiological conditions that are not undergoing rapid change;

b) Accounting for errors introduced by potentially interfering intravascular substances.

13) (original) A method as in Claim 1, wherein the sample comprises at least one of:

- a) A blood sample drawn from the patient;
- b) A blood sample measured intravascularly (indwelling measurement);
- c) Perfused tissue;
- d) Perfused skin;
- e) An ex vivo blood sample in a transmission vessel;
- f) An ex vivo blood sample in a transreflectance vessel;
- g) A blood sample in an on-line flow circuit;
- h) In situ measurement of a perfused tissue; and
- i) In situ measurement of a perfused organ or muscle.

14) (currently amended) A method of determining pH of a sample, comprising:

- a) Determining an infrared spectrum of the sample;
- b) Verifying that the spectrum is spectrally consistent with the calibration model;
- c) Determining the concentration of hemoglobin, hematocrit, or equivalent of the sample;
- d) Determining the pH of the sample from the infrared spectrum, the determined hemoglobin, hematocrit, or equivalent concentration, and a model relating an infrared spectrum and associated hemoglobin concentration to pH.

15) (original) A method as in Claim 14, wherein the model comprises regression coefficients relating an infrared spectrum to sample pH.

16) (original) A method as in Claim 14, wherein the model comprises a model determined from calibration data collected from samples with hemoglobin levels spanning the range of sample hemoglobin levels.

17) (original) A method as in Claim 14, wherein the model comprises a model determined from hemoglobin-specific regression coefficients applied to calibration data collected from samples with hemoglobin levels that do not span the sample hemoglobin range.

18) (original) A method as in Claim 14, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in at least one of transmission, diffuse reflectance, transreflectance, ATR.

19) (original) A method as in Claim 14, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in at least one of transmission, diffuse reflectance, transreflectance, ATR.

20) (currently amended) A method as in Claim 14, A method of determining pH of a sample, comprising:

- a) Determining an infrared spectrum of the sample;
- b) Verifying that the spectrum is spectrally consistent with the calibration model;
- c) Determining the concentration of hemoglobin, hematocrit, or equivalent of the sample;
- d) Determining the pH of the sample from the infrared spectrum, the determined hemoglobin, hematocrit, or equivalent concentration, and a model relating an infrared spectrum and associated hemoglobin concentration to pH;

wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 4000 – 25000-11000 cm-1.

21) (currently amended) A method as in Claim 1420, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 4000 – 8000 cm-1.

22) (currently amended) A method as in Claim 1421, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation in the spectral frequency range from 6000 – 6500 cm-1.

23) (original) A method as in Claim 14, wherein determining an infrared spectrum comprises measuring the sample absorbance of infrared radiation at a spectral resolution of 64 cm-1 or finer.

24) (currently amended) A method as in Claim 14, wherein determining the concentration of hemoglobin comprises at least one of:

- a) Direct measurement of a blood sample using an external instrument or method;
- b) Spectroscopic measurement of a blood sample; and
- c) Noninvasive measurement of perfused tissue.

25) (original) A method as in Claim 14, wherein determining the concentration of hemoglobin comprises at least one of:

- a) Measuring the sample hemoglobin concentration under physiological conditions that are not undergoing rapid change;
- b) Accounting for errors introduced by potentially interfering intravascular substances.

26) (original) A method as in Claim 14, wherein the sample comprises at least one of:

- a) A blood sample drawn from the patient;
- b) A blood sample measured intravascularly (indwelling measurement);
- c) Perfused tissue;
- d) Perfused skin;
- e) An ex vivo blood sample in a transmission vessel;
- f) An ex vivo blood sample in a transreflectance vessel;
- g) A blood sample in an on-line flow circuit;
- h) In situ measurement of a perfused tissue; and
- i) In situ measurement of a perfused organ or muscle.

27) (cancelled)

28) (currently amended) An apparatus as in Claim 27, An apparatus for determining the pH of a sample, comprising:

- a) An illumination system adapted to direct radiation to the sample;
- b) A collection system adapted to receive radiation expressed from the sample responsive to incident radiation;
- c) An analysis system, comprising a model relating two or more of radiation expressed, incident radiation, and hemoglobin concentration to sample pH;

wherein:

- ad) The infrared radiation encompasses the spectral frequency range between 4000 – 25000 cm-1;
- be) Infrared radiation is delivered to the sample through at least one of: optical fibers, light guides, and imaging optics;
- ef) Hemoglobin concentration is determined using radiation in the spectral frequency range from 10,000 – 25,000 cm-1; and
- dg) pH is determined using radiation in the spectral frequency range from 4,000 – 10,000 cm-1 combined with the hemoglobin concentration.

29) (cancelled)